Claims

1.   A method of redrawing a visual display of
graphical data whereby a current display is replaced
by an updated display, comprising, in response to a
redraw request, immediately replacing the current
display with a first approximate representation of
the updated display, generating a final updated
display, and replacing the approximate
representation with the final updated display.

2.   A method as claimed in claim 1, including
replacing said first approximate representation with
one or more successive improved approximate
representations of the updated display before
replacing the last displayed approximate
representation with the final updated display.

3.   A method as claimed in claim 1 or claim 2,
wherein the replacement of the current display by
said first and any subsequent approximate
representations is performed in parallel with
generating said final updated display.

4.   A method as claimed in any preceding claim,
wherein at least said first approximate
representation comprises a scaled version of a
reduced resolution bitmap representation of said
updated display.

5.   A method as claimed in Claim 4, wherein a
subsequent improved approximate representation

1 comprises said scaled version of a reduced
2 resolution bitmap representation of said updated
3 display with vector outlines superimposed thereon.
4
5 6.   A method of generating variable visual
6 representations of graphical data, comprising
7 dividing said graphical data into a plurality of
8 bitmap tiles of fixed, predetermined size, storing
9 said tiles in an indexed array and assembling a
10 required visual representation of said graphical
11 data from a selected set of said tiles.
12
13 7.   A method as claimed in claim 6, wherein a
14 current visual representation of said graphical data
15 is updated by removing redundant tiles from said
16 selected set and adding new tiles to said selected
17 set.
18
19 8.   A method as claimed in claim 6 or claim 7
20 wherein said array of tiles represents graphical
21 data from multiple sources.
22
23 9.   A method as claimed in claim 7, wherein said
24 multiple sources include applications running on a
25 data processing system and an operating system of
26 said data processing system.
27
28 10. A method as claimed in any one of claims 6 to
29 9, including processing subsets of said tiles in
30 parallel.
31

1   11. A method as claimed in any of claims 1 to 5

2   wherein said visual displays are assembled from

3   tiles in accordance with any of claims 6 to 10.

4

5   12. A method of processing a digital document, said

6   document comprising a plurality of graphical objects

7   arranged on at least one page, comprising dividing

8   said document into a plurality of zones and, for

9   each zone, generating a list of objects contained

10   within and overlapping said zone.

11

12   13. A method as claimed in claim 12, wherein a

13   visual representation of part of said document is

14   generated by determining which of said zones

15   intersect said part of said document, determining a

16   set of said objects associated with said zones which

17   intersect said part of said document and processing

18   said set of objects to generate said visual

19   representation.

20

21   14. A method as claimed in claim 11 or claim 12,

22   wherein visual representations of said document are

23   generated by means of a method as claimed in any one

24   of claims 6 to 10.

25

26   15. A method as claimed in claim 14, wherein each

27   of said zones corresponds to at least one of said

28   tiles.

29

30   16. A digital document processing system adapted to

31   implement the method of any of claims 1 to 15.

32

1   17. A system as claimed in claim 16, comprising:
2   an input mechanism for receiving an input
3   bytestream representing source data in one of a
4   plurality of predetermined data formats;
5   an interpreting mechanism for interpreting said
6   bytestream;
7   a converting mechanism for converting
8   interpreted content from said bytestream into an
9   internal representation data format; and
10   a processing mechanism for processing said
11 internal representation data so as to generate
12 output representation data adapted to drive an
13 output device.
14
15 18. A system as claimed in Claim 17, wherein said
16 source data defines the content and structure of a
17 digital document, and wherein said internal
18 representation data describes said structure in
19 terms of generic objects defining a plurality of
20 data types and parameters defining properties of
21 specific instances of generic objects, separately
22 from said content.
23
24 19. A system as claimed in Claim 18, further
25 including a library of generic object types, said
26 internal representation data being based on the
27 content of said library.
28
29 20. A system as claimed in Claim 18 or Claim 19,
30 including a parsing and rendering module adapted to
31 generate an object and parameter based
32 representation of a specific view of at least part

1   of said internal representation data, on the basis
2   of a first control input to said parsing and
3   rendering module.
4
5   21. A system as defined in Claim 20, further
6   including a shape processing module adapted to
7   receive said object and parameter based
8   representation of said specific view from said
9   parsing and rendering module and to convert said
10 object and parameter based representation into an
11 output data format suitable for driving a particular
12 output device.
13
14 22. A system as claimed in Claim 21, wherein said
15 shape processing module processes said objects on
16 the basis of a boundary box defining the boundary of
17 an object, a shape defining the actual shape of the
18 object bounded by the boundary box, the data content
19 of the object and the transparency of the object.
20
21 23. A system as claimed in Claim 22, wherein said
22 shape processing module is adapted to apply grey-
23 scale anti-aliasing to the edges of said objects.
24
25 24. A system as claimed in Claim 21, Claim 22 or
26 Claim 23, wherein said shape processing module has a
27 pipeline architecture.
28
29 25. A system as claimed in any one of Claims 18 to
30 24, wherein said object parameters include
31 dimensional, physical and temporal parameters.
32

1   26. A system as claimed in any of Claims 17 to 25,
2   wherein the system employs a chrominance/luminance-
3   based colour model to describe colour data.
4
5   27. A system as claimed in any of Claims 17 to 26,
6   wherein the system is adapted for multiple parallel
7   implementation in whole or in part for processing
8   one or more sets of source data from one or more
9   data sources and for generating one or more sets of
10 output representation data.
11
12 28. A graphical user interface for a data
13 processing system in which interactive visual
14 displays employed by the user interface are
15 generated by means of a digital document processing
16 system as claimed in any one of Claims 16 to 27.
17
18 29. A data processing device incorporating a
19 graphical user interface as claimed in Claim 28.
20
21 30. A hardware device for data processing and/or
22 storage encoding a digital document processing
23 system as claimed in any one of Claims 16 to 27.
24
25 31. A hardware device as claimed in Claim 30,
26 further including a core processor system.
27
28 32. A hardware device as claimed in Claim 31,
29 wherein said core processor is a RISC processor.
30

1   33. A data processing system including a digital
2   document processing system as claimed in any one of
3   Claims 16 to 27.

4

5   34. A data processing system as claimed in Claim
6   33, wherein said data processing system comprises a
7   portable data processing device.

8

9   35. A data processing system as claimed in Claim
10 34, wherein said portable data processing device
11 comprises a wireless telecommunications device.

12

13 36. A data processing system as claimed in Claim
14 33, wherein said data processing system comprises a
15 network user-terminal.

16

17 37. A peripheral device for use with a data
18 processing system, including a digital document
19 processing system as claimed in any one of Claims 16
20 to 27.

21

22 38. A peripheral device as claimed in Claim 37,
23 wherein said peripheral device is a visual display
24 device.

25

26 39. A peripheral device as claimed in Claim 37,
27 wherein said peripheral device is a hardcopy output
28 device.

29

30 40. A peripheral device as claimed in Claim 37,
31 wherein said peripheral device is an input device.

32

1   41.   A peripheral device as claimed in Claim 37,
2   wherein said peripheral device is a network device.
3
4   42.   A peripheral device as claimed in Claim 37,
5   wherein said peripheral device is a multi-function
6   peripheral device.